6/4.3

$y = \ln(2+\sqrt{x})$ $\frac{dy}{dx} = \frac{1}{2+\sqrt{x}} \cdot 5x^{-1/2}$

$\frac{d}{dx}\left(\sqrt{x}\right)$

$x^{1/2}$

$.5x^{-1/2}$

$\frac{.5x^{-1/2}}{2+\sqrt{x}}$ $\frac{.5x^{1/2}x^{-1/2}}{x^{1/2}(2+\sqrt{x})}$ $\frac{.5}{2x^{1/2}+x^{1/2}}$

$\frac{1}{2\sqrt{x}(2+\sqrt{x})}$

7)

$$y = \ln\left(\frac{x}{1+x^2}\right) \qquad \frac{dy}{dx} = \frac{1}{x} \cdot \frac{}{1+x^2}$$

$$\frac{1+x^2}{x} \cdot \frac{(x)(2x) - (1)(1+x^2)}{(1+x^2)^2}$$

$$\frac{-2x^2 + 1 + x^2}{(1+x^2)^2} = \frac{1+x^2-2x^2}{(1+x^2)(1+x^2)} \cdot \frac{1+x^2}{x} \cdot \frac{1}{1}$$

$$\frac{1+x^2}{1+x^2} \cdot \frac{1}{x}$$

8) $y = \ln(\ln x)$

$$\frac{dy}{dx} = \frac{1}{\ln x} \cdot \frac{d}{dx}(\ln x) = \frac{1}{\ln x} \cdot \frac{1}{x} = \frac{1}{x \ln x}$$

Oct 25-7:26 AM

9) $y = \ln|x^3 - 7x^2 - 3|$

$$\frac{dy}{dx} = \frac{1}{x^3 - 7x^2 - 3} \frac{d}{dx}\left(x^3 - 7x^2 - 3\right)$$

$$\therefore \frac{3x^2 - 14x}{x^3 - 7x^2 - 3}$$

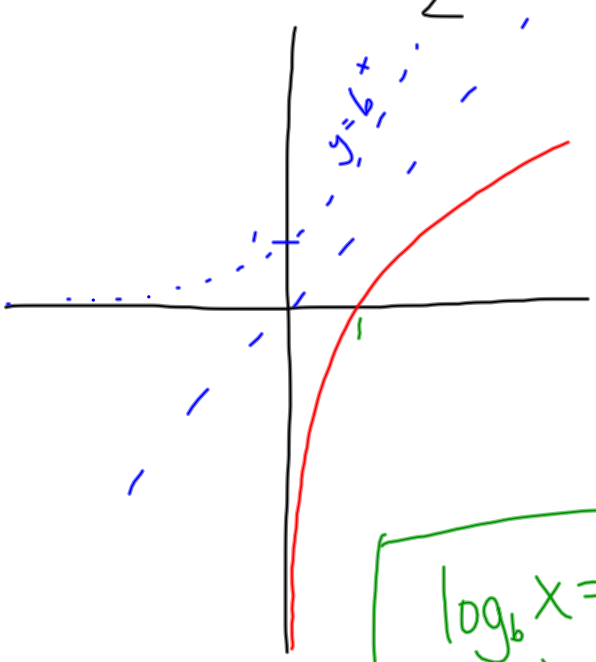
when $x^3 - 7x^2 - 3 > 0$

then $\frac{1}{x^3 - 7x^2 - 3}(3x^2 - 14x)$

when $x^3 - 7x^2 - 3 < 0$

$\frac{dy}{dx}(\ln|-1|) = \frac{1}{-x^3 + 7x^2 + 3}(-3x^2 + 14x)$

Consider $y = \ln x$



$(-2)^{\frac{1}{3}}$ $(-2)^{\frac{2}{3}}$

$\log_b x = y$

$\Updownarrow$

$b^y = x$

rules for logs

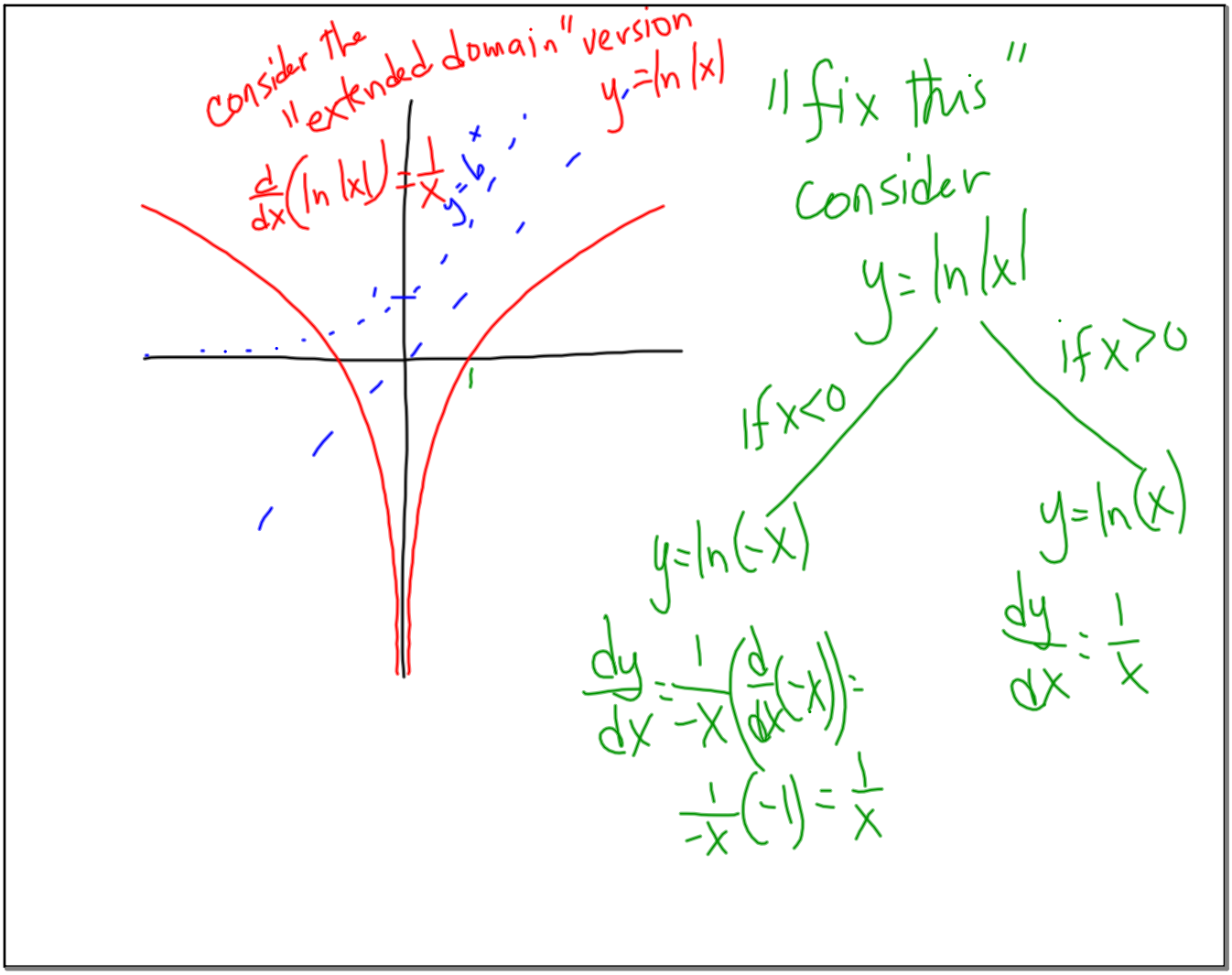
$\log_b xy = \log_b x + \log_b y$

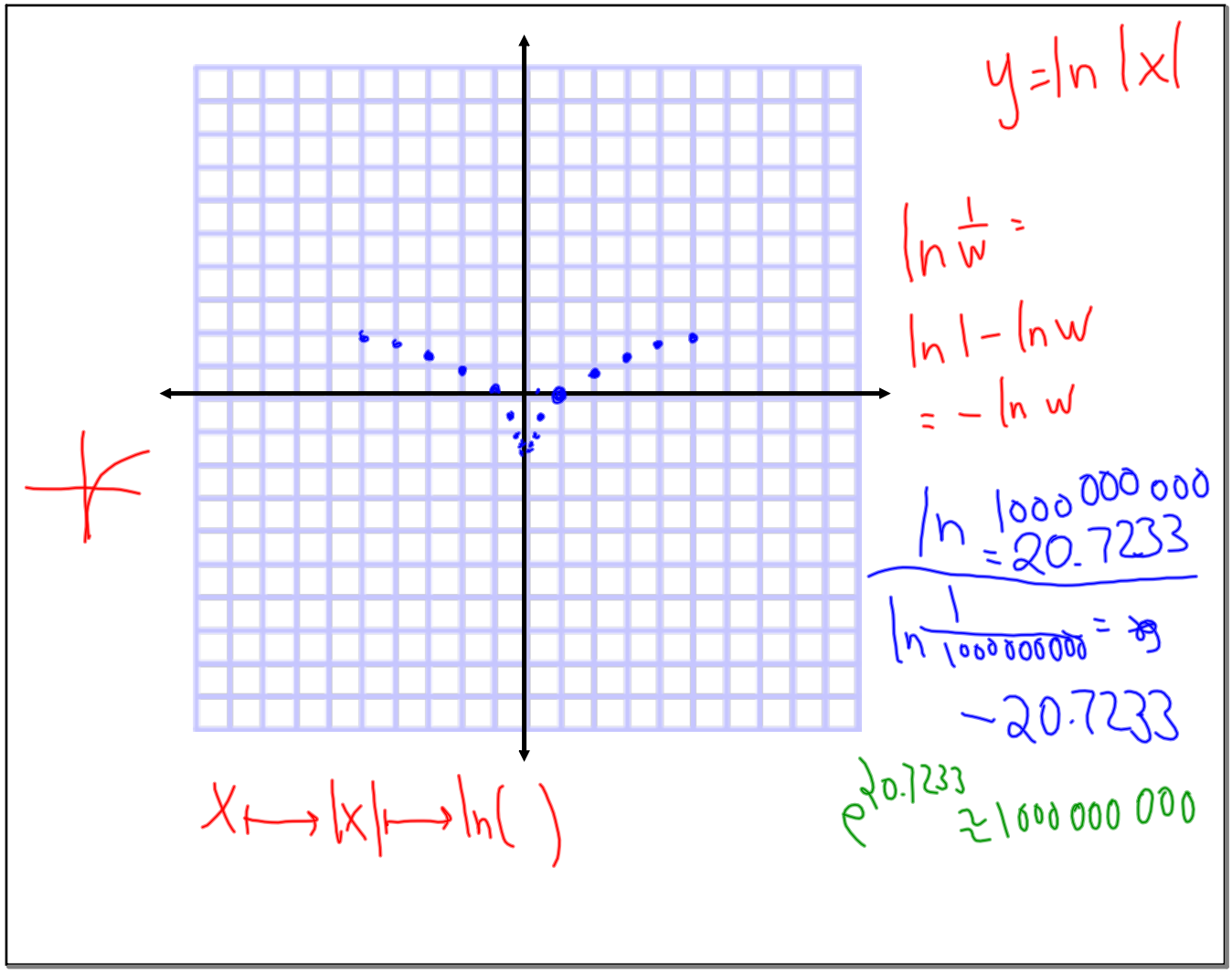
$\log_b \frac{x}{y} = \log_b x - \log_b y$

$\log_b x^y = y \log_b x$

$\log_b b = 1$

$\log_b 1 = 0$


consider the "extended domain" version
$y=\ln|x|$
$\frac{d}{dx}(\ln|x|)=\frac{1}{x}$
"fix this"
consider
$y=\ln|x|$
if $x<0$
if $x>0$
$y=\ln(-x)$
$y=\ln(x)$
$\frac{dy}{dx}=\frac{1}{-x}\left(\frac{d}{dx}(-x)\right)=$
$\frac{1}{-x}(-1)=\frac{1}{x}$
$\frac{dy}{dx}=\frac{1}{x}$


y = ln |x|
ln 1/w =
ln 1 - ln w
= - ln w
ln 1000000000 = 20.7233
ln 1/1000000000 = -20.7233
e^20.7233 ≈ 1000000000
x ⟼ |x| ⟼ ln( )

16) $y = x\left[\log_2(x^2-2x)\right]^3$

$\frac{dy}{dx} =$

$\left(\left(\frac{1}{x^2-2x}\right)\left(\frac{2x-2}{\ln 2}\right)\right)$

$(1)\left(\log_2(x^2-2x)\right)^3 + (x)\left(3\left(\log_2(x^2-2x)\right)^2\right)\frac{2x-2}{\ln(x^2-2x)}$

18. $\frac{\log x}{1+\log x} = \frac{\frac{1}{x\ln 10}(1+\log x) - \log x\left(0+\frac{1}{x\ln 10}\right)}{(1+\log x)^2}$

$\frac{\frac{1+\log x}{x\ln 10} - \frac{\log x}{x\ln 10}}{(1+\log x)^2} = \frac{\frac{1}{x\ln 10}}{(1+\log x)^2}$

$\frac{1}{1} \cdot \frac{1}{(x\ln 10)(1+\log x)^2}$

12) $y = \sqrt{1+\ln^2 x}$

$y = (1+\ln^2 x)^{1/2}$ $\quad \frac{dy}{dx} = .5(1+\ln^2 x)^{-1/2} \cdot (2\ln x)\left(\frac{1}{x}\right)$

$\ln^2 x = (\ln x)^2$